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Notes:
1. Untranslatable words are replaced with asterisks (****).
2. Texts in the figures are not translated and shown as it is.

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FULL CONTENTS

[Claim(s)]
[Claim 1] While preparing a rib locally so that it may consist of a cylinder which carried out the resin form and may become the inner skin with point symmetry focusing on the axis of the direction of a periphery, shaft orientations, the rib made to continue spirally, or a cylinder The golf club shaft characterized by making the height of the above-mentioned rib of the field of the kick point of this golf club shaft lower than the height of the rib of other fields.
[Claim 2] While preparing a rib locally so that it may consist of a cylinder which carried out the resin form and may become the inner skin with point symmetry focusing on the axis of the direction of a periphery, shaft orientations, the rib made to continue spirally, or a cylinder The golf club shaft characterized by making width of the above-mentioned rib of the field of the kick point of this golf club shaft narrower than the width of the rib of other fields.
[Claim 3] While preparing a rib locally so that it may consist of a cylinder which carried out the resin form and may become the inner skin with point symmetry focusing on the axis of the direction of a periphery, shaft orientations, the rib made to continue spirally, or a cylinder The golf club shaft characterized by making the consistency of the above-mentioned rib of the field of the kick point of this golf club shaft smaller than the consistency of the rib of other fields.
[Claim 4] consisting of a cylinder which carried out the resin form, and centering on the axis of the direction of a periphery, shaft orientations, the rib made to continue spirally, or a cylinder to the inner skin in the part except the field of a kick point -- point symmetry and ** -- the golf club shaft characterized by having prepared the rib locally like.
[Claim 5] The resin which fabricates the above-mentioned cylinder is a golf club shaft given in any 1 term of Claim 1 which consists of fiber reinforced resin, or Claim 4.
[Claim 6] The thermoplastics fused from the end is injected into the tubed cavity of a gas ejection molding die. Pour in gas into a cavity simultaneously with impregnation immediately after this impregnation, stick melting resin to the mold face of a cavity by a gaseous pressure, and a cylinder is fabricated. And the manufacture approach of the golf club shaft characterized by having prepared the rib which projects from the cylinder inner skin which cooling water is circulated to the cooling channel prepared near the cavity mold face in the above-mentioned die at the time of this form, and meets this cooling channel and a corresponding mold face.
[Claim 7] [in the field of the kick point of the above-mentioned golf club shaft] The manufacture approach of the golf club shaft according to claim 6 currently fabricated without adjusting the circulating

water temperature which circulates the above-mentioned cooling channel, or changing the architecture of a cooling channel, and making the height of the above-mentioned rib, width, etc. smaller than the rib of other fields or only a kick point order field's preparing a rib.
[Claim 8] The resin injected in the above-mentioned cavity is the manufacture approach of the golf club shaft according to claim 6 or 7 which is the consolidation fiber inclusion resin which made the staple contain.

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention chooses simply the configuration of a rib prepared in shaft inner skin using the gas ejection form approach, and it enables it to set it up especially about the manufacture approach of the golf club shaft of a resin form, and this golf club shaft.
[0002]
[Description of the Prior Art] Conventionally, the tubed golf club shaft made of resin inserts a core into the cavity of a die, injects resin between this Nakago and a cavity mold face, after fabricating and releasing from mold to tubed, extracts a core and is manufacturing the tubed golf club shaft. In the above-mentioned golf club shaft, in order to raise reinforcement, the prepreg sheet which becomes a core from the consolidation fiber is twisted, or the consolidation fiber is twisted around a core by the filament winding method, and it is considered as the golf club shaft which injects resin in this condition and consists of fiber reinforced resin.
[0003]
[Problem to be solved by the invention] In the golf club shaft which consists of the above-mentioned manufacture approach, in order to raise reinforcement, it is difficult to protrude a rib on tubed inner skin while protruding itself and trouble start dramatically. Therefore, adjusting the width of a rib and height, and an arrangement location was not able to be fabricated with sufficient accuracy as the predetermined design while it was dramatically difficult. Moreover, it was almost impossible to have changed the height and width according to the arrangement location of a rib.
[0004] Although it is necessary to raise the rigidity of the whole and to make reinforcement into size in a golf club shaft, in order to carry out at the time of a stroke and to improve ****, it is necessary to prepare the kick point which is the field where flexural rigidity is low. In order to prepare the above-mentioned kick point, by the conventional manufacture approach, the amount of the consolidation fiber, the fiber include angle of the consolidation fiber, and the class of consolidation fiber needed to be changed with other fields, and flexural rigidity needed to be made low, but while trouble started dramatically, it was difficult to consider it as the flexural rigidity as a design.
[0005] [this invention] while this invention enables it to manufacture simply the golf club shaft which was made in view of the above-mentioned problem, and prepared the rib in inner skin The above-mentioned rib is changed in the kick point which is the field where flexural rigidity is low, and other fields, and it aims at offering the golf club shaft which can do a kick point with necessary flexural rigidity in a necessary location.
[0006]
[Means for solving problem] While preparing a rib locally so that it may consist of a cylinder which this invention is Claim 1 and carried out the resin form and may become the inner skin with point symmetry

focusing on the axis of the direction of a periphery, shaft orientations, the rib made to continue spirally, or a cylinder The golf club shaft characterized by making the height of the above-mentioned rib of the field of the kick point of this golf club shaft lower than the height of the rib of other fields is offered. As for especially the height of ribs other than the field of the above-mentioned kick point, 1/2 or less is [1/2 or less] desirable at 1/3 or more 1/10 or more [of the bore of a cylinder]. Moreover, in the field of a kick point, the thing of the quantity of the above-mentioned rib preferably done to 1/3 or less 1/2 or less is desirable.

[0007] Moreover, the golf club shaft which makes width of the rib of the field of a kick point narrower than the width of the rib of other fields like Claim 1 by Claim 2 in the golf club shaft which prepares a rib in inner skin is offered.

[0008] when fixed spacing is opened in the shaft orientations of a cylinder and the above-mentioned rib is protruded on them, the width of ribs other than the field of a kick point is pid / 4 n<=W<pi d/n at least, and its pid / 3 n<=W<pi d/n are desirable -- a kick point field -- the width of the above-mentioned rib -- 1/3 or less is [1/2 or less] desirable especially. (The base width of W= rib, the bore of d= cylinder, number of n= rib)

Moreover, open fixed spacing in the direction of a periphery of a cylinder, and when it protrudes, the above-mentioned rib [the width of ribs other than a kick point field] 1/2 or less is [1/2 or less] desirable at 1/3 or more especially at least 1/10 or more [of the bore of a cylinder] -- a kick point field -- the width of the above-mentioned rib -- 1/3 or less is [1/2 or less] especially desirable.

[0009] Moreover, the golf club shaft which makes the consistency of the rib of the field of a kick point smaller than the consistency of the rib of other fields like Claim 1 by Claim 3 in the golf club shaft which prepares a rib in inner skin is offered. When it protrudes a rib on a cylinder inner surface in the shape of a periphery, as for the consistency of the above-mentioned rib, in a kick point field, it is desirable to make the consistency of a rib small, without protruding a rib covering 4 or less-time die length from more than 2 double [of spacing of the rib of other fields].

[0010] Moreover, the golf club shaft which has not prepared the above-mentioned rib in the field of the kick point like Claim 1 by Claim 4 in the golf club shaft which prepares a rib in inner skin is offered.

[0011] The golf club shaft of above-mentioned Claim 1 or Claim 4 considers it as the taper which a bore reduces gradually from the upper end to which a grip is attached applying to the lower end to which a head is attached, and as the thickness of a cylinder being constant, it is desirable to consider it as the configuration which increases gradually as the thickness to the cross-sectional area goes to a head end. Moreover, the field of a kick point to which flexural rigidity is reduced is chosen according to the overall length of a golf club shaft, a raw material, a weight, a raw material of a head, etc., for example, is established in the approximately center part of shaft orientations.

[0012] As for the resin which fabricates the cylinder of a golf club shaft, consisting of fiber reinforced resin is desirable. (Claim 5) A staple is sufficient as the consolidation fiber made to contain, and a filament or a continuous fiber is sufficient as it. However, when manufacturing a golf club shaft with a gas ejection form, a staple (0.21mm - about 1cm) is used suitably. As the above-mentioned consolidation fiber, carbon fiber, a glass fiber, an aramid fiber, etc. are used suitably, and thermoplasticity resin, such as engineer plastic, such as general-purpose resin, such as polypropylene, polystyrene, and ABS, and polycarbonate, Denaturation PPE, nylon, is suitably used as resin.

[0013] This invention is Claim 6 and offers the manufacture approach of the golf club shaft by the gas ejection form approach. Namely, the thermoplastics fused from the end is injected into the tubed cavity

of a gas ejection molding die. It pours in into a cavity so that gas may be led to the core of melting resin simultaneously with impregnation immediately after this impregnation. Stick melting resin to the mold face of a cavity by a gaseous pressure, and a cylinder is fabricated. And at the time of this form, cooling water is circulated to the cooling channel prepared near the cavity mold face in the above-mentioned die, and the manufacture approach of the golf club shaft characterized by having prepared the rib which projects from the cylinder inner skin along this cooling channel and a corresponding mold face is offered.

[0014] in addition, the timing of impregnation of melting resin and gas -- after ** melting resin injection, after gas impregnation and ** melting resin injection, there are three antenna radiation patterns of impregnation ** simultaneously about simultaneous impregnation and ** melting resin and gas in gas with melting resin, the class of resin and gas etc. is embraced, it shifts, and that approach is adopted.

[0015] the gas used for the above-mentioned gas ejection molding approach -- inactive gas, such as a helium, neon, and argon, -- it is nitrogen gas preferably. In addition, as for especially these gas, it is desirable 100-300kgf/cm2 and to use under the pressure of 400 kgf/cm2.

[0016] In the above-mentioned manufacture approach, [in the field of the kick point of the above-mentioned golf club shaft] It is fabricating without adjusting the circulating water temperature which circulates the above-mentioned cooling channel, or changing the architecture of a cooling channel, and making the height of the above-mentioned rib, width, etc. smaller than the rib of other fields or only a kick point order field's preparing a rib. (Claim 7)

Specifically, water (10 degrees C - 18 degrees C) is circulated, for example to the cooling channel within desired temperature, for example, the die heated in 50 degrees C - 150 degrees C.

[0017] Moreover, as for the resin injected in the above-mentioned cavity, it is desirable to use the consolidation fiber inclusion resin which made the staple contain. (Claim 8)

[0018]

[Function] In a golf club shaft according to claim 1 to 4, since the rib is protruded on the inner skin of the cylinder which carries out a resin form, rigidity can be raised as a whole and improvement in reinforcement can be aimed at. Moreover, make the height lower than the rib of other fields for the rib of the field of a kick point (Claim 1), narrow the width (Claim 2), and the arrangement consistency of a rib is made small (Claim 3). Or since it is considered as the configuration (Claim 4) where the rib is not prepared, the rigidity of the field of a kick point becomes low as compared with the rigidity of other fields. Therefore, the flexural rigidity of the field of a kick point can become low as compared with other fields at the time of a golf ball stroke, and it can generate necessary "becoming by carrying out" by using this kick point as a fulcrum.

[0019] Like the description to Claim 5, if resin is used as fiber reinforced resin, the reinforcement of a golf club shaft can be raised further.

[0020] [the manufacture approach of a golf club shaft according to claim 6] [the part in which the melting resin poured in into the cavity sticks to the mold face of a cavity with a gaseous pressure, and cooling water is circulating] By solidifying melting resin, since it is cooled earlier than other parts, the resin poured in succeeding this solidified surface being pressed by gas, sticking, and repeating this, from the part of others [part / into which cooling water is circulating], thickness serves as size and a rib will protrude. Therefore, the rib of a necessary configuration can be protruded on a necessary location by setting out of the negotiation location of cooling water. Moreover, by controlling the water temperature of cooling water, a circulating water flow, etc., a rib can carry out height control and a rib can be

prepared with sufficient accuracy in the inner skin of a cylinder. Moreover, it can manufacture only at one process of pouring in resin and gas into a forming mold.

[0021] According to the approach according to claim 7, by changing the negotiation form of cooling water, the temperature of cooling water, amount of water, etc., as compared with other fields, a rib can be made small, or the consistency of a rib can be made small in the part made into a kick point field. Thus, the location of a kick point and the flexural rigidity value of this kick point can be set up with sufficient accuracy only by controlling cooling water.

[0022] Since according to the approach according to claim 8 a staple is mixed in melting resin and it can pour into a cavity, also in the form approach by gas injection, a golf club shaft with high reinforcement which consists of fiber reinforced resin can be manufactured.

[0023]

[Working example] The work example of this invention is hereafter explained in detail with reference to Drawings. First, the manufacture approach of a golf club shaft 1 shown in drawing 1 is explained with reference to drawing 5 from drawing 2 . The golf club shaft 1 shown in drawing 1 (A) and (B) is crossed to the whole inner skin of the cylindrical body 2 in the air, and consists of a configuration which protruded the rib 3 which opened fixed spacing in shaft orientations L, and continued in the direction of a periphery. It applied to the lower end (the inside of drawing, left end) to which a head 5 is attached from the upper end (the inside of drawing, right end) to which a grip 4 is attached, and the path of the cylindrical body 2 was reduced gradually and the taper is applied. Thickness T of the cylindrical body 2 is made into the same thickness covering the overall length except for the rib 3.

[0024] The above-mentioned rib 3 makes the height h1 of two ribs 3A of the approximately center part of shaft orientations L lower than the height h2 of the rib 3B of the other field, makes lower than other fields flexural rigidity of the field which protruded the above-mentioned rib 3B, and makes it the kick point field KL.

[0025] The above-mentioned golf club shaft 1 is manufactured with the forming mold 10 for gas injections shown in drawing 5 from drawing 2 . In addition, while the forming mold 10 of drawing 2 to drawing 5 actually shortens the die-length direction L more in order to explain a forming step plainly, the rectangular direction X is shown as a size, therefore, the cylindrical body 2 of the golf club shaft 1 to fabricate is actually shorter in die-length L of shaft orientations, and the radial direction X is shown greatly.

[0026] The forming mold 10 consists of a pair of cope 11, and bottom type 12, forms the crevices 11a and 12a of the shape of a cylindrical shape which a path reduces gradually from a left end applying to a right end in the doubling side S, and forms the cavity 13 in it. Moreover, while forming melting resin and the gaseous impregnation opening 14 in the diameter side head doubling side S of a large at the right end of a cavity 13, the left end byway side head doubling side S has formed the gas omission pore 15.

[0027] The cooling channels 16 and 17 for a rib form are formed so that fixed spacing may be opened in the cope 11 close to the mold face 13a of the direction of a periphery of the above-mentioned cavity 13, i. e., the base of Crevices 11a and 12a, and the core of bottom type 12 in the die-length direction (shaft orientations) L and it may continue in the direction of a periphery. These cooling channels 16 that become circular are two cooling channels of a center section, and the cooling channel 17 is the other cooling channel. The branch pipes 18A and 18B which are open for free passage to the fluctuated types 11 and 12 in the two above-mentioned cooling channels 16, respectively, The common tubing 19A and 19B which opens these branch pipes for free passage was formed, the common tubing 19A of the cope

11 was made to extend to the end-face location of a cope, and it connected with the cooling-water supply pipe 20A, and the common tubing 19B of bottom type 11 was made to extend to a bottom type end-face location, and it has connected with the cooling-water exhaust pipe 20B.

[0028] Similarly the branch pipes 21A and 21B which are open for free passage to many cooling channels 17, the common tubing 22A which opens a branch pipe 21A for free passage, and the common tubing 22B which opens a branch pipe 21B for free passage were formed in the fluctuated type, the common tubing 22A is connected to the cooling-water supply pipe 23A, and the common tubing 22B is connected to the cooling-water exhaust pipe 23B. Thus, it enables it to circulate through the cooling water controlled to desired temperature, respectively to the cooling channels 16 and 17.

[0029] The temperature t1 of the cooling water which flows into the above-mentioned cooling channel 16 from the cooling-water supply pipe 20A is set up more highly than the temperature t2 of the cooling water which flows into the cooling channel 17 from the cooling-water supply pipe 23A. For example, if t2 is used as the tap water of the room temperature of 17 degrees C of abbreviation, t1 will be set as 25 degrees C of abbreviation. In addition, the temperature gradient of t1 and t2 is set up by to what difference the difference between the height h1 of said rib 3A and the height h2 of Rib 3B is designed.

[0030] The above-mentioned forming mold 10 is more expensive than cooling water temperature at least, and is carrying out the heat hold at desired temperature in consideration of the solidification temperature of the thermoplastics to be used etc. In addition, this cooking temperature is the range of 50 degrees C - 100 degrees C of abbreviation.

[0031] In the gas injection form performed using the above-mentioned forming mold 10, first, as shown in drawing 2 , the thermoplastic resin 30 fused from the impregnation opening 14 is poured in with required pressure at this example. In this example, the whole quantity of resin 30 required in order to fabricate a golf club shaft is poured in. The resin 30 injected into the cavity 13 will be in the condition of having solidified in the cavity 13 by the side of the impregnation opening 14, as [show / in drawing 2].

[0032] As it is immediately after impregnation of the above-mentioned resin 30 (i.e., the phase which the fused resin 30 does not solidify), then is shown in drawing 3 , gas is poured in with required pressure from the impregnation opening 14. In this example, the nitrogen gas 31 is poured in under the pressure of 400 bars. This poured-in nitrogen gas 31 is pressed fit in the approximately center part of the melting resin 30 which has become hard in the cavity 13 by the side of the impregnation opening 14, and it circulates to the other end side, pushing and sticking melting resin 30 to the mold face 13a of a cavity 13. At this time, in a cavity, a gaseous pressure acts uniformly and pushes melting resin by a uniform pressure to a mold face.

[0033] In the process in which it is stuck to melting resin 30 by the mold face 13a of a cavity 13, melting resin 30 is early solidified more in the part in which the cooling channels 16 and 17 are located along a mold face 13a. If resin is solidified, the melting resin 30 still fused to the surface of the solidified resin will be further pushed by the pressure of the nitrogen gas 31. By repeating this, from the part which is not cooled, the thickness of the resin pushed against a mold face 13a serves as size gradually, and the rib 3 which projects from the inner skin of a cylindrical body 2 is fabricated by the part in which the cooling channels 16 and 17 are established.

[0034] Moreover, since the water temperature t1 of the cooling channel 16 is set up more highly than the water temperature t2 of the cooling channel 17, The amount in which the rib 3A of the part corresponding to the cooling channel 16 is stuck to the part and melting resin by a solidification rate becoming slow from the rib 3B of the part corresponding to the cooling channel 17 decreases, and the

height h1 of Rib 3A is low fabricated by the height h2 of Rib 3B. In this example, the height h2 of Rib 3B is set to one third of the bores of a cylindrical body 2, and the height h1 of Rib 3A is set to one third of h2.

[0035] The thick acreage which the above-mentioned cylindrical body 2 of the thickness T by which a gas injection form is carried out is constant except for a rib 3, and shows to the cross-sectional area of a cylindrical body 2 by the head end of the left-hand side in drawing where a bore is therefore small serves as Dai, and reinforcement serves as size from the grip mounting side by the side of opposite.

[0036] Since the field in which Rib 3A was formed has the height h1 of this rib 3A lower than the height h2 of the rib 3B of other fields, the part and rigidity become low and the golf club shaft 1 manufactured by the above-mentioned approach serves as the kick point field KR where flexural rigidity is low.

[0037] Drawing 6 and drawing 8 showed the 2nd work example, and the golf club shaft 1 of this 2nd work example countered in the diameter direction, and has formed two ribs 3 which follow shaft orientations L. And two ribs 3 which followed these shaft orientations make width w1 of the approximately center part of the shaft orientations narrower than the width w2 before and behind that, and are. That is, it is considered as the configuration where the rib 3B with wide width followed shaft-orientations both sides on both sides of the rib 3A with narrow width. According to the width w1 of a rib being narrow, from a part with other wide width w2, flexural rigidity becomes low and the field in which Rib 3A is located turns into the kick point field KR.

[0038] The forming mold 10 of the golf club shaft 1 of the 2nd work example is the configuration shown in drawing 7 and drawing 8 , countered in the diameter direction and has established the cooling channels 40 and 41 of a pair of shaft orientations in the core of the die close to the mold face 13a of the cavity 13. These cooling channels 40 and 41 narrow width of a center section, and make it the narrow-width parts 40b and 41b while making them into the double width parts 40a and 41a by making width of the both-sides part of shaft orientations into size.

[0039] Therefore, in the part corresponding to the double width parts 40a and 41a, melting resin 30 is solidified by large width, and when melting resin makes it stick to this solidification part, the rib 3B of double width w2 is fabricated in the above-mentioned forming mold 10. On the other hand, melting resin 30 is solidified by narrow width, and the rib 3A of the narrow width w1 is fabricated in the part corresponding to the narrow-width parts 40b and 41b.

[0040] Although a rib is made to correspond in the diameter direction and is formed two pieces in the 2nd work example of the above, as shown in drawing 9 , spacing may be opened 90 degrees and you may fabricate to four rib 3 shaft orientations, and if it prepares so that a rib 3 may be located in point symmetry to Axis L, six pieces, the eight number of a rib, etc. will not be limited.

[0041] In addition, by making a cooling channel become independent in a shaft-orientations center section and the order both-sides part, and circulating the cooling water whose water temperature is higher than both sides in a center section instead of changing the width of a channel, also when fabricating a rib to the shaft orientations of the 2nd work example The height of a rib may be made lower than both sides, and the kick point KR with low flexural rigidity which consists of a field where the height of a rib is low may be formed by the height of a rib. Furthermore, while narrowing width of a rib, height may also be made low, and you may form a kick point KR. Similarly, when fabricating the rib of the direction of a periphery of said 1st work example, without changing water temperature, the width of a cooling channel may be changed and width of the rib of the kick point field KR and the field to carry out may be made narrower than the width of the rib of other fields.

[0042] Drawing 10 shows the golf club shaft 1 of the 3rd work example, and the height of the rib 3A of the part which protrudes on the inner skin of a cylindrical body 2 spirally, and makes a rib 3 the kick point field KR is made lower than the rib 3B of other fields in this golf club shaft 1. In this case, the cooling channel established in a forming mold is spirally established in the location along the mold face of the cavity, and the cooling channel of the location corresponding to Rib 3A is made to become independent, and is pouring the cooling water whose water temperature is lower than others. In addition, as well as the 2nd work example when a rib is prepared spirally, you may make width of Rib 3A narrower than the rib 3B of other fields.
[0043] Drawing 11 shows the golf club shaft 1 of the 4th work example, and is manufacturing it with the forming mold 10 of drawing 12 . This golf club shaft 1 has formed the rib 3 of the direction of a periphery like the 1st work example, in the kick point field KR, spacing of the shaft orientations of the rib 3 fabricated adjacently is opened, and the arrangement consistency of the rib is made smaller than other fields.
[0044] That is, in the kick point field KR, it opened widely and spacing of the shaft orientations of the cooling channel 44 established in the forming mold 10 is only prepared. Therefore, the common channels 45 and 46 are altogether made open for free passage, it can discharge and these cooling channels 44 can be circulated while they supply the cooling water of the same water temperature, and they can simplify architecture of a cooling channel.
[0046] As mentioned above, if the consistency of a rib is made smaller than the consistency of other fields even if the height and width of a rib 3 are the same, the flexural rigidity of the field concerned becomes low and they can be made into the kick point field KR.
[0047] Drawing 12 shows the golf club shaft 1 of the 5th work example, and does not prepare a rib in a kick point field at all, but spacing is opened in the order field 60 degrees, and the rib 3 of shaft orientations is protruded on inner skin to it. [both sides as shown the forming mold 10 of this golf club shaft 1 in drawing 13 , before and after the kick point field KR removes] The cooling channels 45 and 46 are established in shaft orientations like the 2nd work example inside the die of the location close to the mold face 13a of the cavity 13, and these cooling channels 45 and 46 are made to circulate through cooling water.
[0048] In the golf club shaft shown in the 5th work example from the 1st work example of the above, although the consolidation fiber is not mixed to melting resin, it mixes to melting resin uniformly, a staple (1mm - 3mm) is poured into it, and it can be considered as the golf club shaft which consists of fiber reinforced resin.
[0049] Moreover, although the gas which consists of nitrogen gas immediately after pouring in melting resin is poured in by the required pressure force in the above-mentioned work example, after pouring in some melting resin of requirements, melting resin and gas may be poured in simultaneously, after pouring in gas, melting resin may be poured in, and this may be repeated. Furthermore, you may pour in melting resin and gas simultaneously from the time of impregnation. The melting resin which was poured in into the cavity in any case is pressed so that it may be stuck by the mold face of a cavity with a gaseous pressure, and it can form a hollow-cylinder object by uniform thickness along a mold face. And according to the amount of melting resin injected into a cavity, the thickness of a cylindrical body itself can be set as necessary thickness.
[0050]
[Effect of the Invention] Only by establishing a cooling channel in a forming mold and pouring cooling

water along a cavity mold face first, according to the manufacture approach of the golf club shaft by gas injection according to claim 6, so that more clearly than the above description a rib is prepared in the cylindrical body inner skin of the part corresponding to the location of the cooling channel -- things can be carried out. Moreover, the golf club shaft of the shape of a cartridge with a rib can be manufactured only at one process of pouring melting resin and gas into the core of a cavity, and since a manufacturing process becomes very easy as compared with the conventional golf club shaft manufacture approach, a manufacturing cost can be fallen.

[0051] [especially the rib prepared in the inner skin in the small golf club shaft of a path] Only by a strange frog, the height, width, and an arrangement consistency can be easily adjusted in a necessary location, the water temperature of a cooling channel and the configuration of a cooling channel can be prepared in it, and it comes, and these ribs can be formed with sufficient accuracy as a design. It was dramatically difficult to form as a design the rib prepared in the inner skin of the golf club shaft of a small path by this point and the conventional manufacture approach.

[0052] If the water temperature passed to the cooling channel according to claim 7 established in a forming mold like is changed by a field Or if the width or the consistency of a cooling channel is changed by a field, the arrangement consistency of a rib with narrow width of a rib whose height of a rib is lower than other fields is small, or the field where the rib is not arranged can be prepared easily as a design. That is, a necessary location can be chosen and the kick point field to which flexural rigidity was reduced as compared with other fields can be prepared easily.

[0053] If the consolidation fiber is mixed to the melting resin according to claim 8 poured in into a cavity like, a golf club shaft with big reinforcement which consists of fiber reinforced resin can be manufactured at one process.

[0054] The golf club shaft of this invention according to claim 1 to 5 can be manufactured with simply and sufficient accuracy using above-mentioned Claim 6 or gas injection according to claim 8. [these Claim 1 or a golf club shaft according to claim 5] Since it is considered as the configuration (Claim 4) which makes the height of a rib small (Claim 1), narrows width of a rib in the part made into the kick point field (Claim 2), and makes the arrangement consistency of a rib small (Claim 3), or does not arrange the rib, It can be considered as the origin of birth on which reduce rigidity more certainly than other fields and make flexural rigidity come to fall to at the time of a golf ball stroke. Moreover, the difference between the rigid value in this kick point field and the rigid value of other fields can perform easily choosing the grade it becomes impossible that is set up as a design by the vertical interval of a rib, the difference of width, and the size of a consistency according to the class of golf club shaft etc.

[Brief Description of the Drawings]

[Drawing 1] (A) is the partial fracture front view of the golf club shaft of the 1st work example, and a part of (B) is an expanded sectional view.

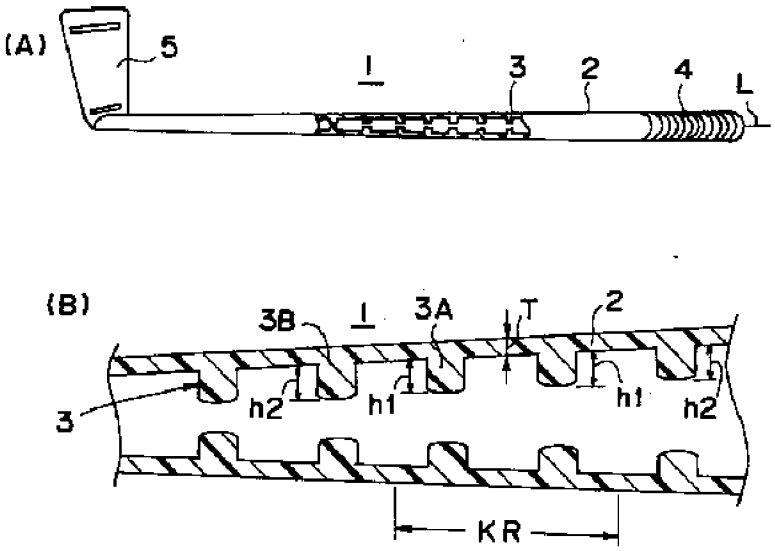
[Drawing 2] It is the sectional view showing the initial stage of the forming step of the golf club shaft of the 1st work example.

[Drawing 3] It is the sectional view showing the interim phase of the forming step of the golf club shaft of the 1st work example.

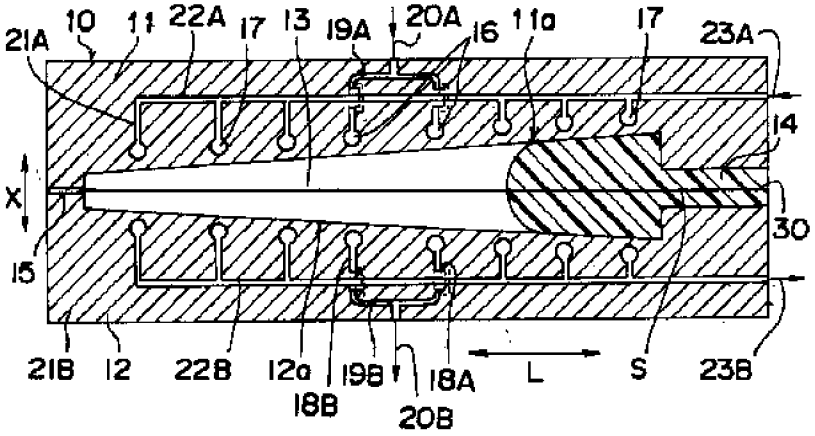
[Drawing 4] It is the sectional view showing the final stage of the forming step of the golf club shaft of

the 1st work example.
[Drawing 5] As for the A-A line sectional view of drawing 4 , and (B), the B-B line sectional view of drawing 4 and (C) of (A) are the C-C line sectional views of drawing 4 .
[Drawing 6] It is the sectional view of the direction of an axis of the golf club shaft of the 2nd work example.
[Drawing 7] It is the sectional view showing the forming step of the golf club shaft of the 2nd work example.
[Drawing 8] It is the A-A line sectional view of drawing 7 .
[Drawing 9] It is the sectional view of a radial direction showing the modification of the golf club shaft of the 2nd work example.
[Drawing 10] It is the fragmentary sectional view of the shaft orientations of the golf club shaft of the 3rd work example.
[Drawing 11] It is the fragmentary sectional view of the shaft orientations of the golf club shaft of the 4th work example.
[Drawing 12] It is the sectional view showing the forming step of the golf club shaft of the 4th work example.
[Drawing 13] It is the fragmentary sectional view of the shaft orientations of the golf club shaft of the 5th work example.
[Drawing 14] It is the sectional view showing the forming step of the golf club shaft of the 5th work example.
[Explanations of letters or numerals]
1 Golf Club Shaft
2 Cylindrical Body
3 Rib
3A The rib of a kick point field
3B The rib outside a kick point field
10 Forming Mold
13 Cavity
13a Mold face
14 Impregnation Opening
16, 17 Cooling channel
30 Melting Resin
31 Nitrogen Gas

[Drawing 1]



[Drawing 2]



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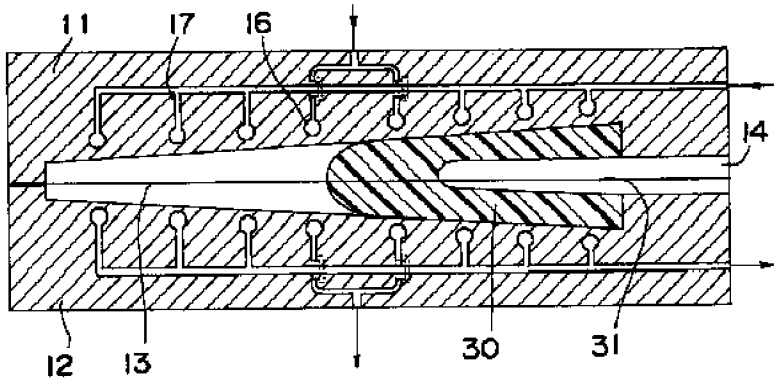

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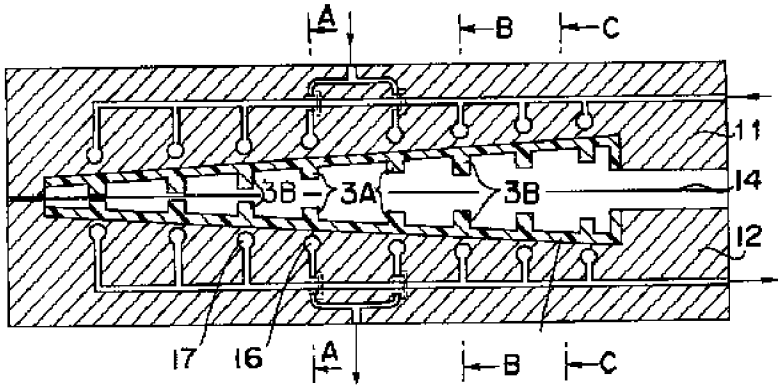

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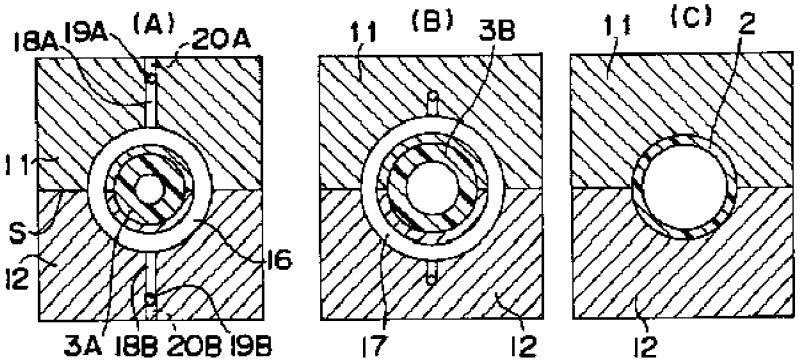

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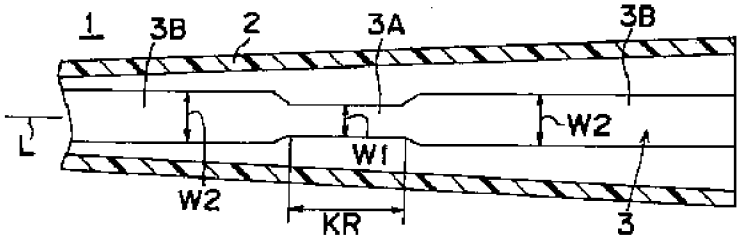
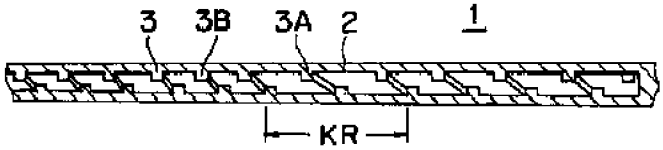


[Drawing 10]



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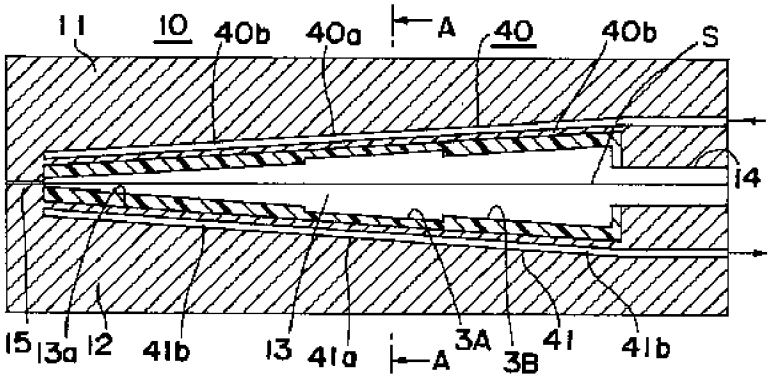
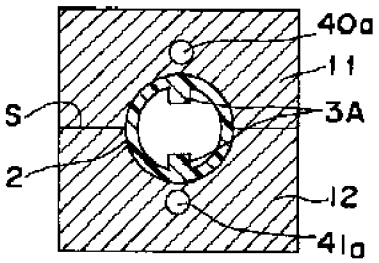
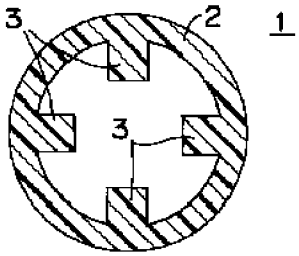


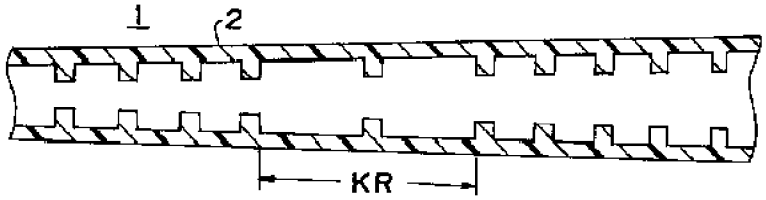
[Drawing 8]



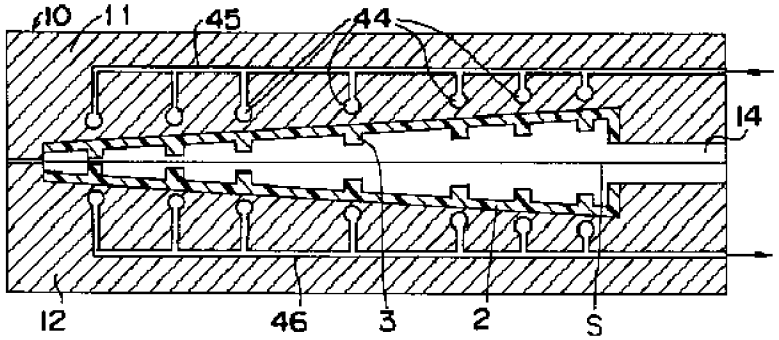
[Drawing 9]



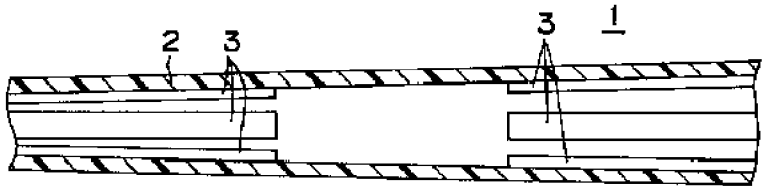
[Drawing 11]



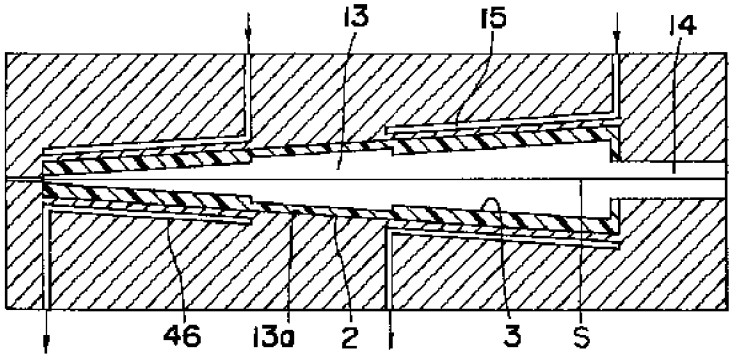
[Drawing 12]



[Drawing 13]



[Drawing 14]



[Translation done.]